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Fig. 1.

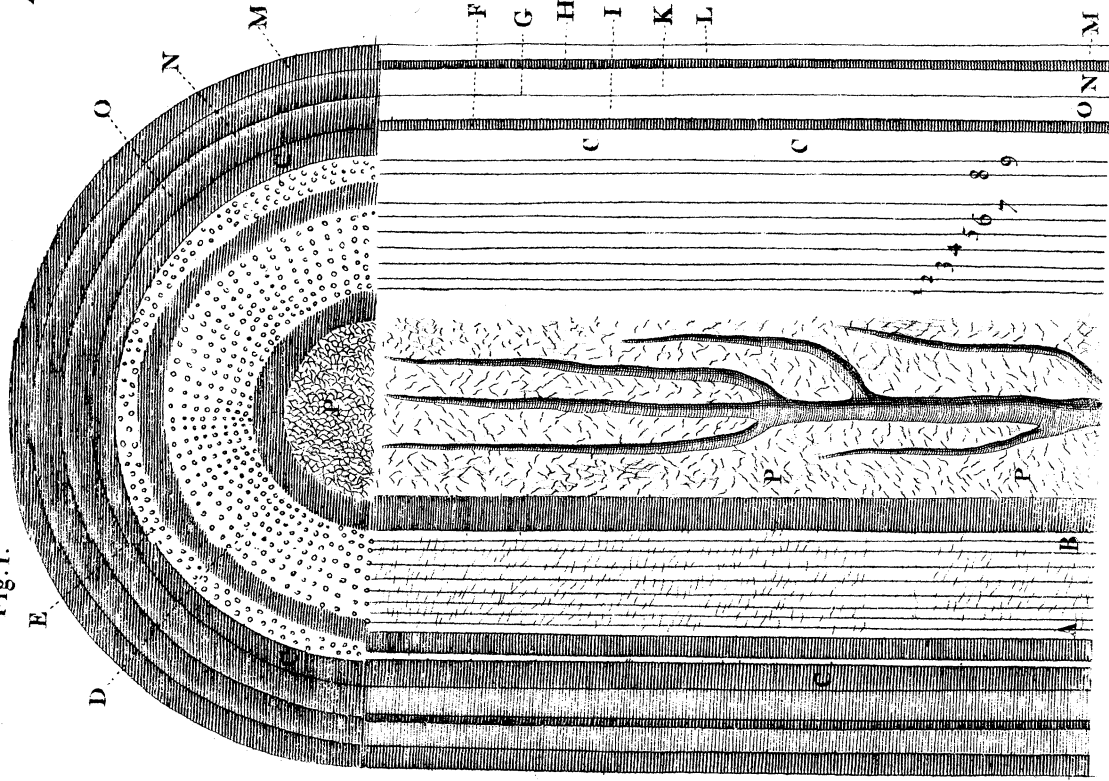


Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



loss of Appetite, as they by degrees came to be afterwards.

Thus having related the Case as the Man told it me, I shall leave the *Ætiology* of it to the learned Physicians, it being sufficient for me to relate the matters of Fact, and thereby testify the Duty and Respects owing to the Society by

Their most obedient

Humble Servant,

W. Derham.

V. *Observations and Experiments relating to the Motion of the Sap in Vegetables.* By Mr. Richard Bradley, R. S. S.

OF Plants in general we may first observe, that they are either *Terrestrial*, *Amphibious*, or *Aquatick*; and so nearly do Vegetables agree with Animals in most points, except Local Motion and its Consequences, that from the Knowledge of the one we are reasonably led to the Discovery of the other.

Those Plants which I call *Terrestrial* are such as *Trees*, *Shrubs* and *Herbs*, which grow only on the Land. These like Land Animals have diversities of Food, a Method of Generating, and certain Periods of Life.

Of the *Amphibious* race, which live as well on Land as in the Waters, are the *Willows*, *Rushes*, *Minths*, &c. these are not unlike in many respects to the *Otter*, *Tortoise*, *Frog*, &c.

The *Aquaticks*, whether of *Lakes*, *Rivers*, or the *Sea*, are very numerous; these may be compared with the Fish-kind, and like them will not live out of their proper

per Element. In *Fresh Waters* are the *Water-Lilly's*, *Plantains*, &c. and in the *Sea*, *Corals*, *Fuci*, &c.

Plants seem to possess only the next degree of Life below the most stupid *Animal*; or where *Animal* Life leaves off the *Vegetable* Life seems to begin.

The Seasons of Motion in *Plants* are the same with those of *Animals*, which sleep during the Winter. An Artificial Heat will give Motion to either of these in the Coldest time.

The common Opinions relating to the *Saps* Motion are as follows. First, The *Sap* does not rise by the *Pith*; because some have observ'd the Trunks of large Trees to be without that part, and yet the same Trees have continued to put forth Fruit, and Branches on their Tops. I have observ'd, that the *Pith* is not found in those Branches of a Tree which exceed two or three Years growth; and it is certain, that the *Pith* which is in a Branch of this Year, will (the greatest part of it) be distributed into those Boughs which form themselves the next Season.

It is said by some, that the Tree does not receive its Nourishment by the *Bark*, for that Trees having lost that part, will still continue their Growth. Others tell us, that if the *Bark* be cut away round the Trunk of a Tree, it will presently die. These various opinions seem to have been set on foot without extraordinary Consideration, upon the belief that a Tree has but one *Bark*: Whereas, upon Examination with the Microscope, we find four distinct Coverings to each Branch, without the woody parts. The two outermost *Barks* may be taken from a Tree without great Damage, but the other two which lye nearer the Wood being strip'd off will kill the Tree.

Some affirm, that the *Sap* doth neither rise nor fall in the woody part of a Tree, because they have not been

able to discern any *Sap* to issue out of that part, when a Branch has been cut. The Microscope plainly shews us the Vessels in the Wood, through which the *Sap* riseth from the Root; but as these Tubes are not large enough to admit into them any thing more gross than Vapour, so they have not been esteem'd to be of any great Use. But I hope the Explanation of the adjoyn'd Figure will in some measure discover the Office of these, and of such other parts of a *Plant* as are severally design'd for the Growth of Vegetables; but it will first be convenient to enquire a little into the Nature of the *Root*.

The *Root* of a Tree is chiefly compos'd of a *Parenchyma*, more gross than that in the Stem or Body of the Tree; it has likewise Vessels and a Covering, which I shall better explain in another Paper. The Root, that is, the principal part of it, receives into it such Juices of the Earth as are proper for it, and no other. Somewhat like a Weck of Cotton, which having been impregnated with Oil, will only admit Oil into it. This Provision being made in the *Stomach* of the *Plant* (as I call it) chiefly in the Autumn Months, the Tree is prepared for Germination so soon as the Earth is sufficiently warm'd, either by the Sun's Beams, or an artificial Heat, such as Horse dung, Bran and Water, or other such like Ferments. These Heats raise into Vapour the Juices contained in the Root, and by that means cause Vegetation.

Figure I. which I am about to explain, is part of the Branch of an *Apple Tree* made in *May 1715*, and cut in *April 1716*. It was cut in figure of a half-Cylinder, the length somewhat more than the Diameter, which was about a quarter of an Inch. This being magnified with one of *Campani's* Microscopes, discovers the following parts, *viz.*

1, 2, 3, 4, 5, 6, 7. are Capillary Vessels, which run longitudinally through the Branch, in the Ligneous part, which was made in the Year 1715. Through these Tubes, the Steam riseth from the Root; the strength of which is well explain'd by the Engine for raising Water by Fire, invented by the late Captain *Savory*.

From A to B, we may view Vessels of the same sort, made at the same time.

8, 9. are Vessels of the same use with the former, now forming themselves for the use of the Year 1716.

By this means the Diameter of the Branch is increas'd, and additional Nourishment suffer'd to pass into those Buds which are to make new Branches. These are made out of the Fourth or innermost Bark, markt C, C.

The Mouths of the Capillary Tubes of the Years 1715, and 1716. are D, E. The Vapour which riseth from the Root, is continued in these Vessels, to the extremities of the Branches; where it meets with parts (not here describ'd) like to *Glands*; which *Glands*, if we may so call them, are likewise found at every Knot or Joynt. At these places, the Vapour coming near the Air is condensed, and returns between the Barks, by means of its own weight, down F, G, H, leaving in each Bark mark'd I, K, L, such Juices as each of them naturally is inclin'd to separate from it; till at last, the more Oily part passing to the Root, may lengthen the *Fibres* thereof, as icicles are lengthned; and by its Oleous Particles, preserve them from Rotting by the Wet. The parts which compose the several Barks, are *Parenchymous* or *Spongy*.

The first mark'd M, is of a closer Texture than the second N, and the second closer than the third O, and so on till these Parenchymous Parts are interwoven with the longitudinal Wood-Vessels, where they are somewhat constrain'd, till they come to make the Pith mark'd P. Then they are much Larger than in any other

other part of the Tree; and by what I have observ'd, seem to contain a more finish'd Juice than the rest, and may well enough be stiled the *Medulla*.

We may note, that when the fourth or innermost Bark C, has once compleated its Sap-Vessels, and is firmly join'd to the Wooden Part, then the third Bark O takes its place for the succeeding Year; and so the rest, except that the first mark'd M, splits and divides its self, to supply the place of the second, as I shall demonstrate hereafter.

Before I conclude, I shall beg leave to recommend the following Enquiry to the Curious, *viz.*

If the several Barks, having different Texture of Parts, admit into each separate and different Juices from the rest: Whether those Juices may not be of very Different Vertues; the first more *Astringent* than the others, the second perhaps *Emetick*; and the third *Cathartick*. This seems to be worth Enquiry.

VI. *Some Microscopical Observations, and Curious Remarks on the Vegetation, and exceeding quick Propagation of Moldiness, on the Substance of a Melon. Communicated by the same.*

I Had lately a large Melon-Fruit, which I split lengthways thro' the Middle, in order to observe the Vessels which compos'd the Membrane or Tunick of each Ovary; but my affairs at that time not permitting me to continue the Work I had began, I lay'd by the one half of the Melon, to be examin'd when I might have more Leisure.